Acromag®

User's Manual: Series 450T
Potentiometer/Slidewire Input, AC-Powered Transmitters

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**IMPORTANT SAFETY CONSIDERATIONS**

It is very important for the user to consider the possible adverse effects of power, wiring, component, sensor, or software failures in designing any type of control or monitoring system. This is especially important where economic property loss or human life is involved. It is important that the user employ satisfactory overall system design. It is agreed between the Buyer and Acromag, that this is the Buyer's responsibility.


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**8500-511-A94A000**


**INTRODUCTION:**

These instructions cover the model types listed in Table 1 below. Supplementary sheets are attached for units with special options or features.

**Table 1:**

A. Model Number Format :
450T-Input-Output-Power-Mounting-Certification[1]
B. Typical Model Number: 450T-P-Y-1-DIN-NCR[1]

| Series | -Input | -Output | -Power | -Mtg | -Cert. |
|---|---|---|---|---|---|
| 450T | -P | -Y | -1 | -DIN | -NCR |
| | | | -2 | | -Approval[2] |
| | | -V0 | | | |
| | | -V5 | | | |

**Notes (Table 1):**

1. Unit cannot be factory calibrated to customer's specifications (no "-C" suffix required).
2. Consult the factory for current information on agency (e.g. Canadian Standards Association, etc.) approvals.

**DESCRIPTION:**

The Series 450T is an AC-powered, DIN-rail mounted transmitter family. This model conditions a direct three-wire potentiometer or slidewire input and converts the wiper rotation or position to a high-level process current or voltage output. The transmitter provides constant voltage excitation to the sensor and allows the use of potentiometers or slidewires with values from 100 ohms to 10K ohms. Applications for this device include the manual control of valves, position sensing for actuators, level sensors, and test equipment. Three-way isolation is provided between the input, output, and power. The unit includes wide range zero and span adjustments. Series 450T transmitters are available for 115V, or 230V AC power (for DC power applications, see the Acromag Series 350T transmitter family). The versatile DIN rail mount can accommodate a variety of mounting applications. See Drawing 4501-419 for a simplified schematic.

The Series 450T transmitters are designed as another functional component that provides the user with a modular approach to the varied applications in the field. Other 450T transmitters are available to condition DC voltage, DC current, thermocouples, frequency, RTD, AC current, and AC voltage inputs. The Series 450T complements the Acromag Series 350T DC-powered transmitters, providing the same input conditioning for AC-powered applications. An entire family of Acromag flat-pack, DIN-rail transmitters, alarms, and isolators are available, providing a flexible and modular solution for a wide range of field applications.

The 450T transmitter is EMI and RFI protected, operates over a wide temperature range, and features excellent temperature coefficients which minimize effects from harsh plant environments. In addition, the safe, compact, rugged, and reliable design of this transmitter allow it to be used in control room or field locations.

Input wiring is inserted in the bottom of the unit, while output and power wiring is inserted at the top of the unit. Screws to secure the wiring are located on the front panel. Connectors are screw-clamp type and accept wire size up to 14 AWG.

**SPECIFICATIONS:**

**Function:** This family of three-way isolated, AC-powered, transmitters condition a three-wire potentiometer or slidewire input using constant voltage excitation, and convert this signal to a process current or voltage output. Wide-range zero and span adjustments utilize 22-turn pots accessible from the front of the unit. Optional 115V AC or 230V AC power is available. This transmitter is DIN-rail mounted.

**MODEL/SERIES: 450T-** (Color coded with a white label)

**INPUT:**
**-P:** 100 ohm to 10,000 ohm three-wire potentiometer or slidewire.

**Excitation:** 0.175V DC nominal, constant voltage, current limited to 2.0mA, nominal.

**Adjustments:**
Zero Adjustment: 0 to 75% of slidewire resistance.
Span Adjustment: 25% to 100% of slidewire resistance.

**Isolation:** Three-way isolation is provided between the input, output, and power circuits for common mode voltages up to 250V AC, or 354V DC, off ground on a continuous basis (will withstand 1500V AC dielectric strength test for one minute without breakdown). This complies with test requirements outlined in ANSI/ISA-S82.01-1988 for the voltage rating specified.

**OUTPUT:** Process Current or Voltage output. Voltage outputs are designed to provide true voltage output, with zero volts included, and to be stable with capacitive loads.

**-Y :** 4 to 20mA DC, R-Load = 0 to 550 ohms
**-V0:** 0 to 10V DC into 10,000 ohms or greater
**-V5:** 0 to 5V DC into 5,000 ohms or greater

**NOTE**: For process current output (-Y units), the loop current may be monitored by placing a DVM between the Output (S) and Output (+) terminal. This connection measures the current drop through a precision 10 ohm resistor placed in series with the Output (+) terminal (± 0.1%, ± 25ppm). Thus, a DVM measurement of 40mV corresponds to 4mA, and 200mV corresponds to 20mA of loop current. For voltage outputs (-Vx units), the Output (S) terminal is electrically equivalent to the Output (+) terminal.

**Output Limiting**: Voltage units (-Vx): 120% of full scale output, nominal. Current unit (-Y): 125% of full-scale output (24mA), nominal.

**Output Ripple**: Less than ±0.1% of the maximum output span.

**POWER:**
**-1:** 115V AC ±10%, 50-60Hz, 0.05A (-Y units), 0.020A (-Vx units).
**-2:** 230V AC ±10%, 50-60Hz, 0.025A (-Y units), 0.010A (-Vx units).

**Power Supply Effect**: Less than ±0.05% of output span for rated supply variations.

**Reference Test Conditions**: Input: 100 ohm slidewire with a 100 ohm span; Output (-Y units): 4-20mA DC (500 ohm load); Output (-Vx units): 0-10V DC into 10K ohms or greater; Ambient $77^{O}$F ($25^{O}$C); +115V AC supply.

**Accuracy**: Better than ±0.1% of calibrated span. This error includes the combined effects of transmitter repeatability, hysteresis, terminal point linearity, and adjustment resolution. Does not include sensor error.

**Ambient Temperature Range:** $-13^{O}$F to $185^{O}$F ($-25^{O}$C to $85^{O}$C).

**Ambient Temperature Effect**: Less than ±0.01% of output span per $^{O}$F (± 0.018% per $^{O}$C) over the ambient temperature range for reference test conditions. Specification includes the combined effects of zero and span over temperature.

**Bandwidth:** -3dB at 2Hz, typical.

**Response Time**: For a step input, the output reaches 98% of output span in 300ms, typical.

**Noise Rejection:**
Common Mode: Better than 130dB at 60 Hz, typical, 100 ohm unbalance.
Normal Mode: 50dB at 60Hz, typical.

**RFI Resistance**: Less than ±0.5% of output span effect with RFI field strengths of up to 10V/meter at frequencies of 27MHz, 151MHz, and 467MHz.

**EMI Resistance**: Less than ±0.25% of output span effect with switching solenoids or commutator motors.

**Surge Withstand Capability (SWC):** Input/Output terminations rated per ANSI/IEEE C37.90-1978. Unit is tested to a standardized test waveform that is representative of surges (high frequency transient electrical interference), observed in actual installations.

**Construction:**
Circuit Boards: Military grade FR-4 epoxy glass circuit board.
Circuit Board Coating: Fungus resistant acrylic conformal coat.
Terminals: Compression type, wire size 14 AWG maximum.
Mounting Position: Position insensitive.
Case: Self-extinguishing NYLON Type 6.6 polyamide thermoplastic UL94 V-2, color black. General Purpose, NEMA Type 1 enclosure.

**MOUNTING:**

**-DIN**: General Purpose Housing, DIN-Rail Mount - "G" & "T" rails. "G" Rail (32mm), Type EN50035; "T" Rail (35mm), Type EN50022. Refer to Drawing 4501-348 for outline and clearance dimensions. Shipping Weight: 1 pound (0.45 Kg) packed.

**CERTIFICATION:** Consult the factory for current information on the availability of agency (e.g. Canadian Standards Association, Factory Mutual, etc.) approvals.

**-NCR**: No Certification Required.

**INSTALLATION:**

The transmitter is packaged in a general purpose enclosure. Use an auxiliary enclosure to protect against unfavorable environments and locations. Maximum operating ambient temperatures should be within -13$^{O}$F to 185$^{O}$F (-25$^{O}$C to 85$^{O}$C) for satisfactory performance. Factory calibrated units are ready for installation. Connect as shown in the connection Drawing 4501-419. If the unit is not factory calibrated, refer to the "CALIBRATION" section.

**Mounting:** Mount transmitter assembly - refer to Drawing 4501-348 for mounting and clearance dimensions.

**DIN Rail Mounting:** Use suitable fastening hardware to secure the DIN rail to the designated mounting surface. A transmitter, can be mounted to either the "T" or "G" Rail. Installation of the transmitter to the rail depends on the type of DIN rail used (see Drawing 4501-348). Units can be mounted side-by-side on 1.0-inch centers, if required.

**Electrical Connections:**

The wire size used to connect the unit to the control system is not critical. All terminal strips can accommodate wire from 14-26 AWG. Strip back wire insulation 1/4-inch on each lead before installing into the terminal block. Input wiring may be shielded or unshielded twisted pair. Output wires should be twisted pair. Since common mode voltages can exist on signal wiring, adequate wire insulation should be used and proper wiring practices followed. It is recommended that output and power wiring be separated from the signal wiring for safety, as well as for low noise pickup.

1. **Power**: The label on the unit specifies the AC power requirements. Connect AC power as shown in the Connection Drawing 4501-419. Use suitable wire per applicable codes. For 115V AC units, connect the AC HOT power lead to the (L1) terminal and the AC NEUTRAL power lead to the terminal marked (W). For 230V AC units, connect the AC L1 power lead to the (L1) terminal, and AC L2 power lead to the terminal marked (L2). Connect the AC GROUND lead to the (G) terminal (the AC Ground terminal is not connected internally).
2. **Grounding:** The transmitter housing is plastic and does not require an earth ground connection. If the transmitter is mounted in a metal housing, a ground wire connection is required. Connect the ground terminal of the metal housing (Green Screw) to a suitable earth ground using appropriate wire per applicable codes.
3. **Output:** Connect output per Connection Drawing 4501-419. Load range is a function of the module's output type; refer to "Output" in the preceding "SPECIFICATIONS" section. The output is isolated from the input and power circuits.
4. **Input:** Connect input per Connection Drawing 4501-419. **NOTE:** The input circuit is electrically isolated from the output and power circuits, allowing the input to operate up to 250V AC, or 354V DC, off ground on a continuous basis.

**CALIBRATION:**

The calibration example below is used for reference only. Calibration is essentially the same for units with other input spans.

**Adjustment Procedure:**

Connect transmitter as shown in Connection Drawing 4501-419. The unit should be calibrated using the actual slidewire or potentiometer used in the end system. The output voltage or current must be measured to 0.05% accuracy or better for proper results.

The Zero and Span adjustments are accessible on the front panel of the transmitter, see Drawing 4501-419 for their location. The screwdriver blade used to adjust the potentiometers should not be more than 0.1 inch (2.54mm) wide.

**Transmitter - Calibration Example:**

MODEL : 450T-P-Y-1-DIN-NCR
Input : Slidewire, 0 to 10K ohms
Output : 4-20mA DC
Power : 115V AC

1. Set the slidewire to its minimum position for your application. Adjust the Zero (Z) pot until the output reads 4.000mA DC.
2. Set the slidewire to its maximum position for your application. Adjust the Span (S) pot until the output reads 20.000mA DC.
3. Repeat steps 1 and 2 until the readings converge. The instrument is now calibrated. Several mid-point values should also be checked to verify proper operation of the transmitter.

**GENERAL MAINTENANCE:**

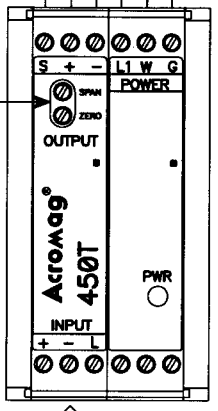
The transmitter contains solid-state components and requires no maintenance, except for periodic cleaning and calibration verification. When a failure is suspected, a convenient method for identifying a faulty transmitter is to exchange it with a known good unit. It is highly recommended that a non-functioning transmitter be returned to Acromag for repair, since Acromag makes use of tested and burned-in parts, and in some cases, parts that have been selected for characteristics beyond that specified by the manufacturer. Further, Acromag has automated test equipment that thoroughly checks the performance of each transmitter.

VOLTAGE (–V0, –V5)
OR
CURRENT (–Y) OUTPUT

R LOAD
+ –
OUTPUT

OUTPUT (S)
SEE NOTE 1

TRANSMITTER ZERO AND
SPAN ADJUSTMENTS

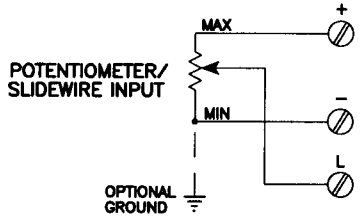



POTENTIOMETER/
SLIDEWIRE INPUT

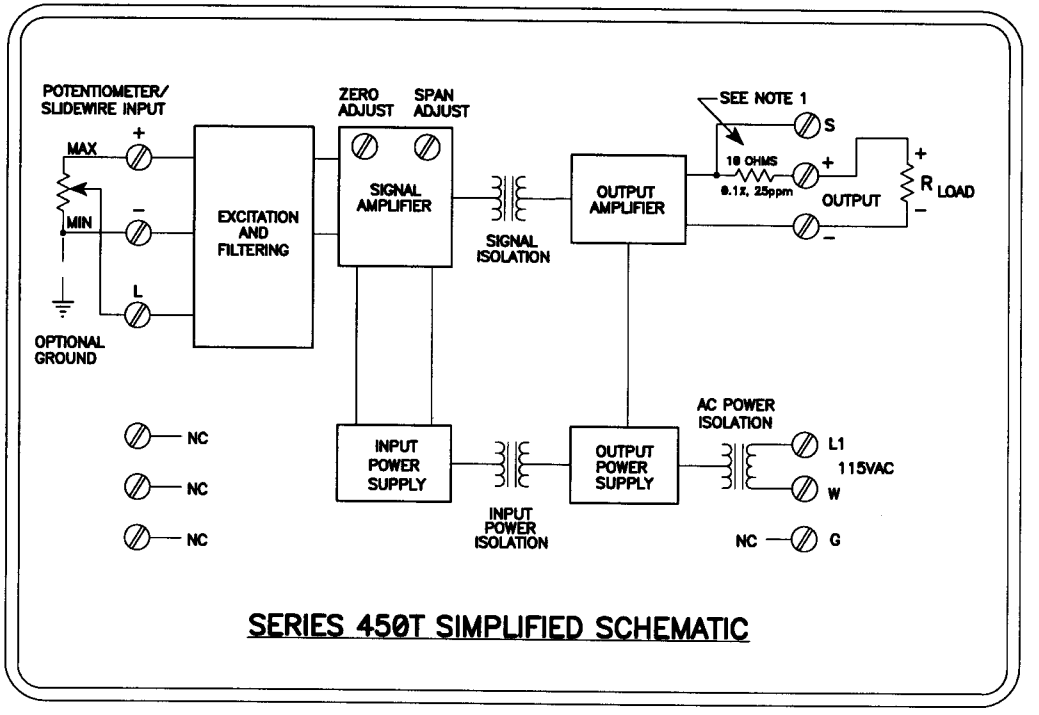
AC INPUT POWER

| –1 OPTION | | –2 OPTION | |
|---|---|---|---|
| 115V AC | | 230V AC | |
| L1 | AC (HI) | L1 | AC (HI) |
| W | AC (LO) | L2 | AC (LO) |
| G | GROUND | G | GROUND |

NOTE: INPUT GROUND TERMINAL IS
NOT CONNECTED INTERNALLY.




INPUT CONNECTIONS




SERIES 450T SIMPLIFIED SCHEMATIC

# SERIES 450T POTENTIOMETER/ SLIDEWIRE INPUT ELECTRICAL CONNECTIONS

NOTE:

1. FOR PROCESS CURRENT OUTPUT UNITS (–Y), A PRECISION 10 OHM RESISTOR IS PLACED IN SERIES WITH THE OUTPUT (+) TERMINAL (+/–0.1%, 25ppm). A DVM MAY BE CONNECTED BETWEEN THE OUTPUT (S) AND (+) TERMINAL TO MONITOR THE LOOP CURRENT. THUS, A DVM MEASUREMENT OF 40mV IS EQUIVALENT TO 4mA AND 200mV IS EQUIVALENT TO 20mA OF LOOP CURRENT. FOR VOLTAGE OUTPUT UNITS (–Vx), THE OUTPUT (S) TERMINAL IS ELECTRICALLY EQUIVALENT TO THE OUTPUT (+) TERMINAL.

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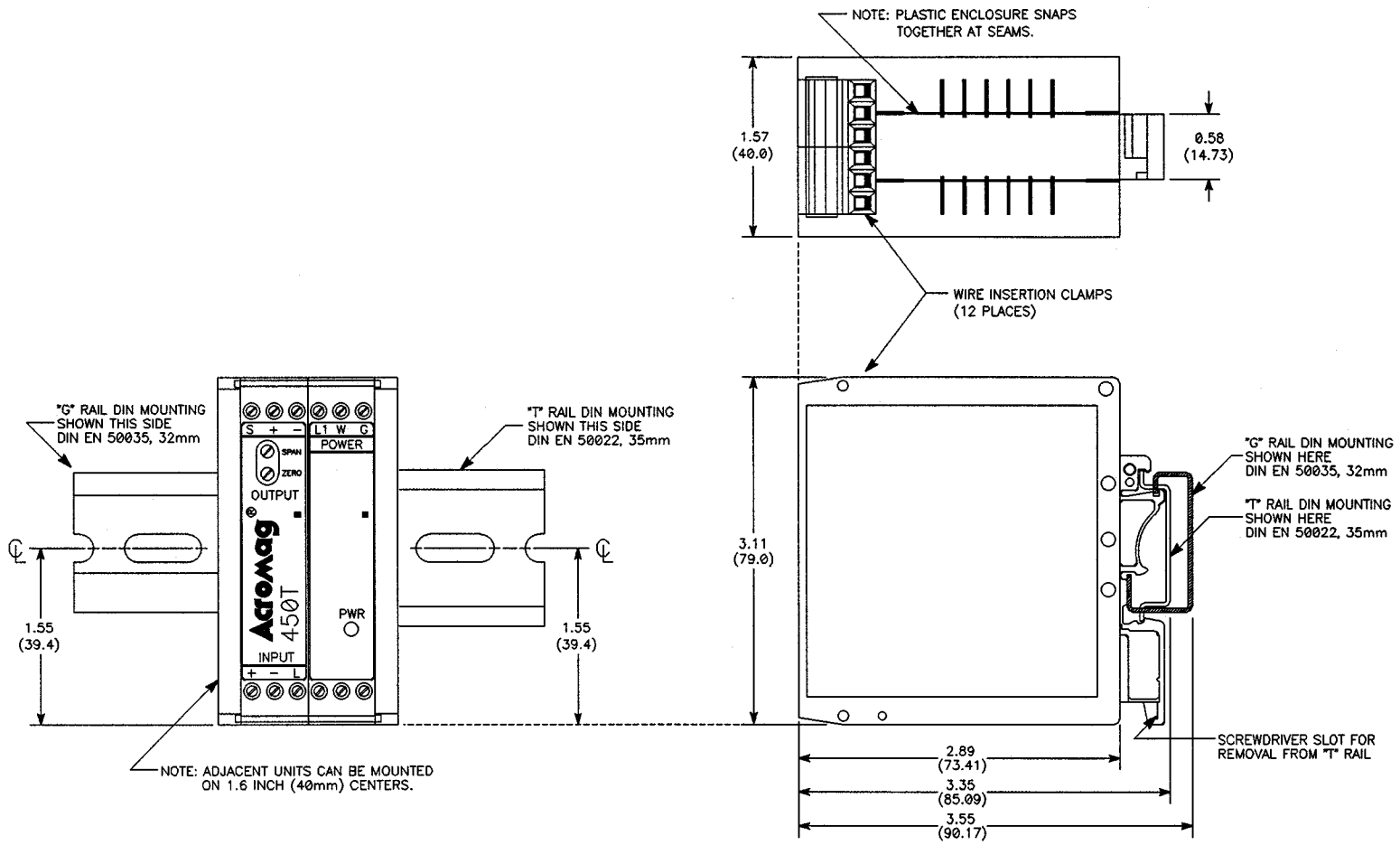
TITLE: POTENTIOMETER/SLIDEWIRE INPUT CONNECTIONS

| D | SERIES 450T | 1 OF 1 | DWG NO. 4501-419 | A REV |
|---|---|---|---|---|




# ENCLOSURE DIMENSIONS FOR DIN RAIL MOUNTING

NOTE: ALL DIMENSIONS ARE IN INCHES (MILLIMETERS).

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Acromag WIXOM, MICH. | | 23 SEP 93 | A | — | KG | BC | BC |
| | | DATE | REV | ECN | DR | ENG | CLP |
| TITLE: SERIES 450T HOUSING: DIN RAIL MOUNT | | | | | | | |
| D | SERIES 450T | 1 OF 1 | DWG NO. 4501-348 | A | REV | | |